

REMARKS

Status

Claims 1-21 were originally filed. In response to a restriction requirement, claims 15-21 have been previously canceled. The present amendment cancels claim 1 and adds new claim 22. Accordingly, it is claims 2-14 and 22 which are presently at issue.

The Rejections

In a final Office Action mailed June 7, 2006, then pending claims 1-8, 11 and 13-14 were rejected under 35 U.S.C. §102 as being anticipated by U.S. Patent 6,274,461 of Guha. In addition, claims 8-9 were rejected as obvious over the combination of Guha '461 and U.S. published patent application 2003/0036090 of Patil. Claim 12 was rejected under 35 U.S.C. §103 as being obvious over Guha '461 and U.S. Patent 5,786,023 of Maxwell.

The Amended Claims

The present invention, as is defined in new claim 22, the sole independent claim, is directed to a plasma deposition process for the preparation of high quality layers of microcrystalline semiconductor material. As detailed in the specification of the subject patent application, semiconductor materials may be deposited by a plasma deposition process in which a process gas which includes at least one of the components of the semiconductor material is energized by electromagnetic energy so as to create a reactive plasma which deposits a layer of semiconductor material on a substrate maintained in proximity thereto. In accord with the present invention, various of the parameters of the deposition process which include the concentration of the process gas, the pressure of the process gas, the power density of the electromagnetic energy, the frequency of the electromagnetic energy and/or the temperature of the substrate are controlled so as to cause the deposited semiconductor material to be

microcrystalline. Further in accord with the present invention, the concentration of a diluent material in the process gas is varied as the thickness of the depositing layer of microcrystalline semiconductor material increases. As taught in the present application, varying the concentration of the diluent as a function of depositing layer thickness assures that the quality of the body of microcrystalline semiconductor being deposited will remain uniformly high. All these limitations are expressed in new claim 22. In addition, claims 2-14 have been amended to depend from claim 22.

The Prior Rejection under 35 U.S.C. §102

In the previous prosecution of this patent application, the Examiner rejected independent claim 1 and various claims dependent thereupon as being anticipated by the 6,274,461 patent of Guha. It is the Examiner's position that the Guha '461 patent shows a process for the deposition of microcrystalline semiconductor material by a plasma deposition process wherein the concentration of a diluent material in a process gas is controlled as a function of the thickness of the depositing microcrystalline layer. In this regard, the Examiner pointed with specificity to the passage in the '461 patent at column 2, lines 43-61.

Applicant has previously contested this rejection both before the Examiner and in documents filed in connection with the previously pending appeal of this case. Applicant hereby incorporates all of those remarks and documents by reference. Specifically, Applicant notes that the Guha '461 patent is very explicitly directed to methods for the deposition of **amorphous semiconductor materials**. While the '461 patent does acknowledge that the plasma deposition process disclosed therein could operate to produce microcrystalline semiconductor materials, it teaches that such materials are undesirable, and that parameters of the deposition process must be selected to assure that the semiconductor material being deposited is, and remains, amorphous.

This is made very clear from the explicit language of the '461 patent, as for example at column 1, lines 54-59; column 2, lines 9-16; and column 2, lines 54-59, wherein it is specifically stated that the process of the '461 patent is carried out "so as to produce a relatively ordered amorphous material." Thus all claims at issue are directed to subject matter which is novel with regard to the '461 patent.

The subject matter of Claim 2 recites that during the deposition process, the concentration of the diluent material is decreased as the thickness of the microcrystalline layer increases. This claim is further patentable insofar as the teaching of the '461 patent is directly opposed. It is very notable that the '461 patent teaches that in order to prepare high quality amorphous material the level of the diluent material in the process gas should be decreased as layer thickness increases. The '461 patent cautions that this is essential in order to maintain the material in the desirable amorphous state and not enter into the undesirable microcrystalline state. In this regard see, for example, column 6, lines 40-53. Thus, the teaching to be gleaned from the '461 patent is (1) the microcrystalline state must be avoided; and (2) in order to avoid entering the microcrystalline state, diluent levels must be decreased as layer thickness increases. The present invention, in contrast, teaches that (1) the amorphous state is to be avoided and the microcrystalline state is to be achieved; and (2) to assure deposition of microcrystalline material, the concentration of the diluent material in the process gas is decreased as layer thickness increases. This teaching is not found in, and is counterintuitive in view of, the '461 patent which, as noted above, teaches that decreasing diluent contents assures that the material remains amorphous. Any teaching to be gleaned from the '461 patent would be that decreasing the diluent concentration as a function of thickness fosters continuing growth of a desirable amorphous material as opposed to an undesirable microcrystalline material. Therefore, if one of

skill in the art were to adopt the teaching of the '461 patent with regard to the deposition of microcrystalline materials, such teaching would lead one to increase the diluent concentration as the deposition of the microcrystalline material proceeds and not decrease it.

Clearly, the '461 patent, while it acknowledges that microcrystalline semiconductor materials may be prepared in a plasma deposition process, does not show or suggest the presently claimed invention. The '461 patent specifically teaches away from the desirability of preparing microcrystalline materials. In that regard, the '461 patent teaches the preparation of amorphous materials and further teaches that such materials may be reliably prepared by decreasing the concentration of a diluent gas as the deposition of the layer proceeds. Therefore, the teaching to be gleaned is that adjusting the process gas concentration in this manner will foster the continuing deposition of amorphous materials whereas not decreasing (or increasing) the concentration of the diluent will foster growth of microcrystalline materials. As is specifically recited in the present application, and is detailed in claim 2, the present invention prepares high quality microcrystalline materials by decreasing diluent concentration as the deposition of the microcrystalline material proceeds. This teaching is exactly opposite the teaching of the '461 patent and, as such, cannot possibly be held to be shown or suggested therein.

The Prior Rejections under 35 U.S.C. §103

In view of the general inapplicability of the '461 patent, all rejections based upon the '461 patent in combination with secondary prior art are also overcome.

Conclusion

As detailed hereinabove, the claims presently pending recite subject matter which is neither shown nor suggested in the '461 patent insofar as those claims are all directed to the deposition of a microcrystalline semiconductor material, a process and result which are

specifically taught in the '461 patent as being undesirable. Also, the process of the present invention wherein the concentration of the diluent gas is decreased as layer thickness increases (as is recited in claim 2) is nowhere shown in the '461 patent with regard to microcrystalline semiconductor materials and is specifically taught away from. For the reasons set forth above, all claims presently pending are allowable.

Request for Interview

The distinctions between the prior art of record and the present invention are subtle but very significant. Applicant notes for the record that two of the three inventors of the present application are also the inventors of the '461 patent. For this reason, Applicant suggests that it would be very valuable for one or more of the inventors to speak directly with the Examiner and discuss the teaching and limitation of the '461 prior art and the manner in which the present invention was made and distinguishes over the prior art.

The Director is hereby authorized to charge any deficiency in the fees filed, asserted to be filed or which should have been filed herewith (or with any paper hereafter filed in this application by this firm) to our Deposit Account No. 07-1180.

Dated:

Respectfully submitted,

By

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